

**REMARKS**

By this Amendment, the specification is amended to address informalities. Claims 1-7, 9, 10 and 12 are amended, and new claims 13-20 are added, without adding new matter. Claims 1-20 are pending. Reconsideration and allowance are respectfully requested in light of the above amendments and the following remarks.

**Form PTO-1449**

Applicants have attached a form PTO-1449 to correct a typographical error in the form PTO-1449 filed on June 18, 2004. In the attached form, the document EPO 1 295 970 is cited. This document was cited as EPO 1 295 979 in the June 18, 2004, form. The Examiner is respectfully requested to initial the attached form to acknowledge consideration of the cited reference.

**Rejection Under 35 U.S.C. § 112, ¶2**

Claims 1-12 were rejected under 35 U.S.C. § 112, ¶2.

Claims 1-7, 9, 10 and 12 are amended to further clarify the claimed subject matter. The amendments address the objections at sections (1) and (2) of the Office Action.

For the Examiner's convenience, Applicants have attached information regarding MCrAlY coatings, which is entitled "Coatings for high temperature applications::Bond coats::MCrAlY." As described in the section of the information headed "Microstructure," MCrAlY coatings can contain  $\gamma$  (gamma),  $\gamma'$  (gamma prime) and  $\beta$  (beta) phases. Two-phase microstructures, such as those of  $\gamma/\beta$  phases, can be present in these MCrAlY coatings. As described in the section headed

"Composition and role of additions," the "M" of MCrAlY stands for Ni, Co or Ni + Co. In steels, "M" can also be Fe. Applicants submit that the meaning of each of these terms is well known in the art.

Regarding the term "laser remelting" recited in claim 5 and new claim 14, this term applies to various types of pre-deposited coatings described herein, e.g., plasma spraying, e-beam PVD, slurry processes, electroplating or a previous laser deposition (laser metal forming). The laser remelting modifies the structure and properties of the pre-deposited layer, e.g., converts polycrystalline material into a single crystal structure. Applicants submit that the meaning of the term "laser remelting" would be understood by one having ordinary skill in the art.

Applicants submit that claims 1-12 satisfy the requirements of 35 U.S.C. § 112, ¶2. Therefore, withdrawal of this rejection is respectfully requested.

#### **Objections to Specification**

As suggested by the Examiner, the specification is amended to correct obvious informalities without adding any new matter. The status of Application Nos. EP 01122819.4 and EP 01122818.6 is also updated. Withdrawal of the objections is respectfully requested.

#### **Rejections Under 35 U.S.C. § 102**

Claims 1, 3, 5, 6, 8, 11 and 12 were rejected under 35 U.S.C § 102(b) over U.S. Patent No. 6,405,435 to Konter et al. ("Konter"). This rejection is respectfully traversed.

Claim 1, as amended, recites a method of depositing a MCrAlY-coating on the surface of a single crystal or directionally solidified article. The method comprises the steps of: (a) depositing the MCrAlY-coating on the surface of the article only at a local area; and (b) subsequently to step (a), converting the deposited MCrAlY-coating into a single crystal coating which is epitaxial with the single crystal or directionally solidified material of the article (emphasis added).

In the claimed method, the MCrAlY-coating is deposited on the surface of the article only at a local area. The article is a single crystal or directionally solidified article. Subsequently to depositing the MCrAlY-coating, the deposited MCrAlY coating is converted into a single crystal coating, which is epitaxial with the single crystal or directionally solidified material of the article. In an exemplary embodiment of the claimed method, the coating is applied only at one or more areas on the surface of the article where thermal stresses and mechanical loads are high and thus benefit from the protection provided by the coating. The claimed method can be used for coating new articles, or for coating, e.g., repairing, used coatings.

Applicants submit that Konter does not disclose or suggest a method of depositing a MCrAlY-coating on the surface of a single crystal or directionally solidified article that comprises every feature of claim 1. Konter discloses a method for producing or repairing cooling channels in monocrystalline components of gas turbines. Konter's method comprises masking cooling channels 7a with a thermally stable filling material 3 on the gas turbine component 1. A different, epitaxial layer 6 is created above the filling material 3. The filling material 3 is removed by etching. See the Abstract. The monocrystalline layer 6 is created above the filling material 3 using an energy source (laser 4 is depicted) and additional material (powder 5 is

depicted). Figure 4 indicates the lateral growth direction of the layer 6. The filling material 3 can be a ceramic and the layer 6 can be composed of a superalloy. (Column 3, lines 17-18 and 45-50.)

Konter's method is different from the claimed method for a number of reasons. For example, in Konter's method, the filling material 3 is applied and subsequently removed from the article. Konter does not disclose that the filling material is an MCrAlY-coating. In the claimed method, the MCrAlY-coating is deposited on the surface of a single crystal or directionally solidified article, and subsequently the deposited coating is converted into a single crystal coating, which is epitaxial with the single crystal or directionally solidified material of the article.

In addition, Konter does not deposit the epitactic layer 6 on the surface of an article only at a local area, and subsequently convert the layer 6 into a single crystal coating, which is epitaxial with the single crystal or directionally solidified material of the article. In contrast, Konter directly builds up the epitactic layer 6 using an energy source and additional material, not by converting a previously-deposited coating material into a single crystal material. Accordingly, claim 1 is patentable over Konter.

Dependent claims 3, 5, 6, 8, 11 and 12 are also patentable over Konter for at least the same reasons as those for which claim 1 is patentable. Therefore, withdrawal of this rejection is respectfully requested.

Claims 1, 3-5 and 12 were rejected under 35 U.S.C § 102(a) over EP 1295969 ("EP '969") or EP 1295970 ("EP '970"). This rejection is respectfully traversed.

EP '969 discloses a method of epitaxially growing a MCrAlY-coating 6 on a surface 5 of an article 4 having a single crystal structure. The coating 6 is formed on the surface 5 by a laser cladding process. In the laser cladding process, particles of the MCrAlY coating material are impinged onto a molten pool 2 formed by scanning a laser beam 3 over the surface 5. (Figure 1 and page 3, paragraph [0020].)

Applicants submit that the EP '969 laser cladding technique does not anticipate the claimed MCrAlY-coating method, which comprises depositing a MCrAlY-coating on the surface of a single crystal or directionally solidified article, and subsequently converting the deposited MCrAlY-coating into a single crystal coating. The converted coating is epitaxial with the single crystal or directionally solidified material of the article.

Accordingly, claim 1 is patentable over EP '969. Dependent claims 3-5 and 12 are also patentable over EP '969 for at least the same reasons as those for which claim 1 is patentable.

EP '970 discloses a method of epitaxially growing a MCrAlY-coating 6 on a surface 5 of an article 4 with a single crystal structure. The coating 6 is formed by a laser cladding process, which comprises impinging particles of the MCrAlY coating material onto a molten pool 2 formed by scanning a laser beam 3 over the surface 5. See Figure 1 and page 3, paragraph [0022], of EP '970.

The EP '970 laser cladding technique also does not anticipate the claimed MCrAlY-coating method. Accordingly, claim 1 is also patentable over EP '970. Dependent claims 3-5 and 12 are also patentable over EP '970 for at least the same reasons as those for which claim 1 is patentable.

Therefore, withdrawal of the alternative rejection over EP '969 or EP '970 is respectfully requested.

**Rejections Under 35 U.S.C. § 103**

Claims 9 and 10 were rejected under 35 U.S.C § 103(a) over Konter in view of EP 0740977 A1 ("EP '977"). This rejection is respectfully traversed.

As discussed above, Konter does not suggest a method of depositing a MCrAlY-coating on the surface of a single crystal or directionally solidified article comprising, *inter alia*, the conversion of a previously-deposited MCrAlY-coating material into a single crystal material, as recited in claim 1.

Applicants submit that EP '977 fails to cure the deficiencies of Konter regarding the method of claim 1. EP '977 discloses a container-less method of producing crack-free metallic articles. The EP '977 method comprises melting a filler material into a metallic substrate or seed. The molten pool can be formed using a laser beam. EP '977 discloses that a material is added to the pool and then solidifies to form a deposit. The material can alternatively be applied to the surface before melting. (Column 2, lines 56-58.) EP '977 does not disclose or suggest that the material that is added to the melt, or applied to the surface, solidifies to form single crystal material. The solidified material is remelted. (Column 3, lines 34-58.) Accordingly, it is submitted that the Office has not articulated a reason to combine the teachings of Konter and EP '977 to result in the method recited in claim 1. Thus, claims 9 and 10 are patentable over the applied references.

Therefore, withdrawal of this rejection is respectfully requested.

Claims 1-3, 6, 7, 9 and 12 were rejected under 35 U.S.C § 103(a) over U.S. Patent No. 4,798,441 to Foster et al. ("Foster '441") in view of U.S. Patent No.

5,037,513 to Foster et al. ("Foster '513") and optionally Konter. This rejection is respectfully traversed.

Initially, it is Applicants' understanding that Foster '441 is U.S. Patent No. 4,789,441, which is cited in the PTO-892 attached to the Office Action. Foster '441 discloses a method of coating a substrate using electrolytic deposition. The applied coating can be subjected to a heat treatment to improve its properties. (Column 2, lines 3-4.) Foster '441 does not explicitly disclose that the heat treatment converts the applied coating into a single crystal coating.

Foster '513 discloses a process for producing a composite coating on a workpiece by electrolytic or electroless deposition. In this process, particles are co-deposited with a metal from a solution. See the Abstract. Foster '513 discloses an example of the coating process at columns 5 to 6. In the example, the coated blades are "heat treated to effect some interdiffusion between the matrix and the particles and to effect some degree of alloying." (Column 6, lines 9-11.) Foster '513 does not explicitly disclose that the heat treatment converts the applied coating into a single crystal coating.

Thus, neither Foster '441 nor Foster '513 explicitly discloses converting a locally-applied MCrAlY-coating into a single crystal coating, which is epitaxial with the single crystal or directionally solidified material of the article. However, the Office contends that the Foster '441 process would appear to "inherently [produce] epitaxial results, otherwise it does not appear possible that the coating could be described as equiaxed when on a single crystal substrate." Applicants respectfully disagree.

Foster '441 discloses that the coating has fine particles evenly distributed in an equiaxed matrix. The term "equiaxed" is commonly used in the art to describe



polycrystalline grain structures, but not single crystal structures, which have only a single grain. Foster '441 does not support the position that the heat treatment, which is designed to improve properties of the coating, would necessarily convert the composite coating structure to a single crystal structure. It is well established that "[i]nherency ... may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999) (citations omitted). In the absence of some factual basis supporting the alleged inherency, Applicants submit that the rejection is improperly based on speculation. *In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967).

Foster '513 also does not cure the deficiencies of Foster '441 in regard to the method of claim 1.

The Office further asserts that Konter discloses the "desirability of creating epitaxial coatings of analogous MCrAlY materials onto single crystal gas turbine components," and that it would have been obvious to insure that the heating procedures taught by Foster '441, which "effects a crystallization is sufficient to insure that epitaxial result." See the paragraph bridging pages 9 to 10 of the Office Action. Applicants respectfully disagree.

In Konter's coating process, the epitaxial layer 6 is directly built up using the energy source and additional material, not by the conversion of a previously-deposited coating material into a single crystal material. As such, the combination of Foster '441 and Konter does not suggest the method recited in claim 1. Thus, claim 1 is also patentable over the combination of Foster '441, Foster '513 and Konter.

Dependent claims 2, 3, 6, 7, 9 and 12 are also patentable over the applied references for at least the same reasons as those for which claim 1 is patentable. Therefore, withdrawal of this rejection is respectfully requested.

**Rejection Under 35 U.S.C. § 102 / § 103**

Claim 4 was rejected under 35 U.S.C § 102(b) or, in the alternative under 35 U.S.C § 103(a), over Konter, or alternatively in view of EP 1001055 ("EP '055"). This rejection is respectfully traversed.

As discussed above, Konter does not anticipate or render obvious the method recited in claim 1.

EP '055 has been cited in the rejection in regard to the features of claim 4. Applicants submit that the Office has not articulated a reason to combine the teachings of Konter and EP '055 to result in the method of claim 1. Thus, claim 4, which depends from claim 1, is patentable over the applied references. Therefore, withdrawal of this rejection is respectfully requested.

**Obviousness-Type Double Patenting Rejections**

Claims 1-12 were rejected under the doctrine of obviousness-type double patenting over claims 1, 4, 5, 7, 9-13 and 15-20 of co-pending Application No. 10/726,593 in view of Foster '441, optionally considering Konter.

The '593 application is not presently co-pending with this application. Therefore, withdrawal of this rejection is respectfully requested.

Claims 1 and 3-5 were rejected under the doctrine of obviousness-type double patenting over claims 1 and 4 of U.S. Patent No. 7,014,923 to Schnell et al. ("Schnell").

Schnell discloses a method of epitaxially growing a MCrAlY-coating 6 on a surface 5 of a single-crystal article 4. Schnell's method uses laser cladding in which particles of MCrAlY coating material are impinged onto a molten pool 2 formed by controlled laser heating. The melt solidifies to form the coating 6. (Column 3, line 54 to column 4, line 2.)

Applicants submit that method of claims 1 and 4 of Schnell does not suggest the method of depositing a MCrAlY-coating on the surface of a single crystal or directionally solidified article recited in claim 1, comprising the steps of: (a) depositing the MCrAlY-coating on the surface of the article only at a local area; and (b) subsequently to step (a), converting the deposited MCrAlY-coating into a single crystal coating which is epitaxial with the single crystal or directionally solidified material of the article (emphasis added). Therefore, withdrawal of this rejection is respectfully requested.

Claims 8-12 or claims 6, 8, 11 and 12 were rejected under the doctrine of obviousness-type double patenting over claims 1 and 4 of Schnell in view of EP '977, or Konter, respectively.

As discussed above, neither EP '977 nor Konter provides any reason to modify the method of epitaxially growing a MCrAlY-coating onto a surface of an article recited in claims 1 and 4 of Schnell to result in the method recited in present

claim 1. Thus, the alternative groups of dependent claims are also patentable.  
Therefore, withdrawal of this rejection is respectfully requested.

### **New Claims**

Independent claim 14 recites a method of depositing a MCrAlY-coating on the surface of a single crystal turbine article, the method comprising the steps of: (a) depositing the MCrAlY-coating on the surface of the turbine article only at a local area, the deposited MCrAlY-coating being polycrystalline; and (b) subsequently to step (a), converting the deposited polycrystalline MCrAlY-coating into a single crystal coating which is epitaxial with the single crystal material of the turbine article by laser remelting (emphasis added). Claims 14-20 are also patentable.

### **Conclusion**

For the foregoing reasons, the application is in condition for allowance.  
Should there be any questions concerning this reply, the Examiner is respectfully requested to contact the undersigned at the telephone number given below.

Respectfully submitted,

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